EXHIBIT E

UNITED STATES DISTRICT COURT
DISTRICT OF NEW JERSEY

PATRICK BRADY, *et al.*, Plaintiff, v. AIR LINE PILOTS ASSOCIATION INTERNATIONAL, Defendant.	Civil Action No. 02-2917 (JEI)

EXPERT REPORT OF KATIA P. SYCARA, PH.D.

March 15, 2013

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I. Qualifications

I am a Research Professor in the School of Computer Science at Carnegie Mellon University, where I have been on the faculty since 1988. I also hold (part time) the Sixth Century Chair in Computing of the University of Aberdeen in the United Kingdom, a position I have held since 2005. I have a BS degree in Applied Mathematics from Brown University, MS degrees in Mathematics and in Electrical Engineering from the University of Wisconsin, and a PhD degree in Computer Science from Georgia Institute of Technology.

My area of research within computer science is artificial intelligence. I have been a Fellow of the Institute of Electronic and Electrical Engineers since 2006, an honor limited in any year to one-tenth of one percent of the Institute's total voting membership. I am also a Fellow of the Association for the Advancement of Artificial Intelligence, and the recipient of the 2002 Association of Computing Machinery (ACM) SIG of Artificial Intelligence Award for Research Excellence in Autonomous Agents and Multi-Agent Systems. I am currently a member of a 15 member committee for the National Academies study, "From Data to Decision: Integrating Humans, Machines and Networks." I have organized multiple scientific conferences and have authored or co-authored more than 450 scientific articles. I have given numerous invited talks, founded the *Journal of Autonomous Agents and Multi-agent Systems*, and am currently on the editorial board of seven additional journals.

In my doctoral dissertation, in 1987, I proposed a theory of argumentation in the context of negotiation and mediation, and developed computational algorithms to generate persuasive arguments. The domain of application of the theory was labor management negotiations. Since then, one of my strands of research work has been in argumentation and negotiation with more recent work in multi-cultural negotiation. My work on argumentation and negotiation, as well as my work in multi-agent coordination in general, is widely cited in the academic literature.

A copy of my full CV is included as Appendix A.

II. Retention and Scope

The law firm of Paul, Weiss, Rifkind, Wharton & Garrison LLP, as counsel to the Air Line Pilots Association, International, has asked me to evaluate the use of my persuasive argumentation model in the report of Rikk M.T. Salamat in *Brady et al.* v. *Air Line Pilots Association, International,* Civil Action No. 02-2917 (JEI).

I am being compensated in connection with my work in this matter at my customary hourly rate of $500/hour. My compensation is not in any way contingent on the opinions I express or on the outcome of this litigation.

III. Documents Considered

In performing my analysis, I have reviewed Mr. Salamat's October 12, 2012 expert report and his deposition in this case. I have also reviewed other relevant materials, including the trial transcript. A complete list of documents considered is attached as Appendix B.

IV. Summary of Opinions

Based upon my education, experience, and expertise, as well as my review of Mr. Salamat's report and other materials from this case, my opinion is that Mr. Salamat has misapplied my theory of persuasive argumentation. Mr. Salamat's application of my argumentation theory to estimate how much better (for the TWA pilots) a hypothetical agreement between the TWA pilots and APA would have been, had ALPA taken actions which plaintiffs alleged it failed to pursue, does not support Mr. Salamat's qualitative analysis, quantitative analysis, or conclusions.

My opinion is based on the following:

- Although Mr. Salamat admits that the actions that ALPA allegedly did not take *are not arguments*, he nevertheless uses my persuasive argumentation model, which presupposes that arguments are used, as a framework to estimate the probability of a hypothetical agreement between TWA pilots and the APA had certain actions been taken.

- Mr. Salamat applies my argumentation model to what he characterizes as a single issue negotiation over pilot seniority, but a key assumption of my theory, which he ignores, is that the negotiation involves multiple issues.

- Mr. Salamat fails to construct a structure of the beliefs and goals of the persuadee (APA), even though construction of such a model is a crucial element in my theory.

- Although Mr. Salamat admits that in this case, the importance of an issue and perception of an issue's value cannot be distinguished, he nevertheless treats them as separate in his estimation framework.

- My argumentation model does not prescribe any means of estimating probabilities of success in reaching an agreement. However, Mr. Salamat uses my theory to estimate such probabilities, which is inconsistent with the design of my model.

V. My Academic Work on Persuasive Argumentation

My argumentation theory presents a computational model of how a software agent can generate plausible persuasive arguments in negotiation to guide parties toward convergence to an agreement. A software agent is a computer program that has an explicit objective, e.g. producing arguments, that it wants to achieve and also has a set of computational methods that it can use in order to achieve that objective. In my 1990

article, *Persuasive Argumentation in Negotiation*, the software agent generates arguments that are directed towards a union or a company. The purpose of the argumentation is to bring about changes in the beliefs and goals of the parties so that they can reach a mutually satisfactory agreement. While this is the only one of my articles that Mr. Salamat references in his report, I have published other articles on the subject, as detailed in my CV.

In my theory, a persuasive argument is an utterance that causes changes in either (a) the persuadee's behavior, or (b) his set of beliefs. In particular, "the argumentation process can be described as follows: an agent reasons about another agent using his own model of that other agent, finds as many ways as the model will allow to affect the other agent's outcomes (behavior), and uses them selectively to influence the other agent" (Sycara 1990 p. 204). Therefore one of the cornerstones of my theory is for the persuader to have a model (a computer-interpretable representational structure) of the persuadee's beliefs and to understand how the persuadee's beliefs may influence his behavior. This representational structure is then utilized to generate arguments that can influence the persuadee based on an understanding of the relationship between the persuadee's individual beliefs and goals.

A second characteristic of my argumentation model is that it pertains to negotiations with multiple issues, where tradeoffs can be made to allow for mutually acceptable agreements. For example, in a negotiation involving wages, pensions, and seniority, a union might accept lower wages in exchange for increased pension contributions by the company.

To allow for comparison of alternative agreements, a model of weighted linear combinations of utilities of the constituent issues is assumed. In other words, for each issue, the importance of that issue is multiplied by the utility the offered amount gives to the party. In a multi-issue negotiation, the overall acceptability of an offer is then determined by the summation of these constituents. Therefore each proposal is a linear combination of the importance/weight of an issue multiplied by the utility to a party of the issue's proposed amount. This model allows the importance of an issue and the perception of an issue's utility to be changed independently of each other (via argumentation, see below).

Different parties can have different beliefs regarding the importance of an issue and/or assign different utilities or values to an issue's particular proposed amount. For example, party A may give importance 0.8 (on a scale of 0 to 1.0) to wages and importance 0.2 to vacations whereas party B may give importance of 0.4 to wages and 0.6 to vacations. Correspondingly, party A may perceive the offer of $100,000/year wage as having a low utility (e.g. utility= 0.3) whereas party B may see $100,000/year wage as having high utility (e.g. utility= 0.7). The notion of utility differs from the notion of an offered monetary amount and depends on the particular circumstances and beliefs of a party. The utility/value of $100, for example, is different for a billionaire than for a poor person. In a negotiation, a party needs to have not only knowledge of what importance and utility he/she attaches to each issue and proposed issue amount, but also some knowledge about

what importance and utility (for each issue amount) *the other party* attaches to each issue and issue's amount. A persuader then has to take into consideration not only the change in importance or perception of an issue's value he may want to achieve but also the particular amounts that he may be willing to give on each issue (and that he needs to give to convince the other party to move toward accepting his offer).

A party's goals in the negotiation may be linked to higher level goals that they contribute to and may be supported by subgoals. A structure that represents a party's goals, subgoals, dependency links and other parameters (e.g. the importance of a goal, contribution of a sub-goal to a higher level goal, feasibility of accomplishing a goal), is the *belief structure* of a party.

The computer program discussed in my 1990 article, the *Persuader*, functions in an algorithmic way. Its basic strategy is to use argumentation to search a space of possible solutions for one in which both parties' multivariate utility functions fall above their reserves, and comprise a solution that both parties can accept. The arguments the *Persuader* generates are methods that, based on its current model of the parties' goals, beliefs, preferences and their dependencies, might bring about changes in the parties' offers and demands that lead to a mutually acceptable agreement.

My persuasion model posits that, in order to change a persuadee's beliefs to make him/her more amenable to making concessions to reach an agreement, a persuader generates arguments to (i) change the importance of a persuadee's issue/goal, (ii) change the persuadee's perception of an issue's value, and (iii) pursue goal abandonment on the part of the persuadee via threats/promises.

My theory enables the use of different argumentation strategies to generate arguments. My theory posits that these classes of arguments are distinct and separately influence changing the importance of an issue, changing the perception of an issue's value, and promoting goal abandonment.

The argumentation strategies that are theorized in my model to change the importance of an issue are: (Sycara 1990, p. 223)

(a) indicate a change (increase or decrease) in the contribution of the present goal to a higher level goal of the persuadee;
(b) indicate a change in the feasibility of the proposed goal.

The argumentation strategies that my model posits to change the persuadee's perception of an issue's value are:

(a) recall a counter-example from the persuadee's past behavior;
(b) recall examples of similar peers that have accepted the same value for an issue.

The argumentation strategies that are theorized to possibly result in goal abandonment on the part of the persuadee are:

(a) promise the persuadee the fulfillment of a more important goal if he abandons the current goal;

(b) point out that insistence on the current goal threatens a more important goal of the persuadee.

Although threats and promises are sometimes advantageous in a negotiation, there are circumstances in which they should be used cautiously or not at all. First, threats should not be used when a persuader would jeopardize one of his/her own goals that is more important than the one he/she is hoping to achieve. In other words, there is a risk of harm in using threats because threats can backfire. A second situation where threats should not be used (or at least should be used cautiously) is when the persuader does not control the contingencies at hand. Controlling the contingencies means that the persuader must have the means at his disposal to bring about the threatened outcome. In other words, in order to be persuasive, threats and promises must be credible.

The domain of application of my persuasive argumentation theory is labor negotiations between a union and management. In my articles I give several examples from real union and management negotiations to illustrate the application of the argumentation model as well as the algorithmic procedures for generating arguments.

VI. Mr. Salamat's Report Misuses My Theory of Persuasive Argumentation

As discussed in section V, my theory is one of persuasive argumentation, which employs an algorithmic process to generate plausible persuasive arguments. The theory is directed toward multi-issue negotiations where tradeoffs are possible. Mr. Salamat's application of my theory contains numerous fundamental errors.

In his report (p. 8), Mr. Salamat states that he uses my argumentation theory to estimate how much more favorable the agreement reached in the TWA/APA seniority integration negotiations would have been to TWA pilots if ALPA had taken certain actions which plaintiffs allege it failed to pursue. (See Salamat figure 2.) Salamat then attempts to characterize these ALPA actions according to the strategies of a persuader in my argumentation theory. In particular, as to each ALPA action, Mr. Salamat indicates whether he believes the action had the potential to change the importance of an issue, change the perception of an issue's value or lead to goal abandonment.

The first major flaw in Mr. Salamat's methodology is that he uses a theory of argumentation in an effort to estimate the probability of reaching a hypothetical agreement had certain actions been taken, although these actions according to his own admission are not arguments. In other words, Mr. Salamat uses the wrong tool for his estimation. In particular, although Mr. Salamat's report seems to suggest that he evaluated the actions that ALPA allegedly had at its disposal as if they were argumentation strategies under my model, he acknowledged in his deposition that this is not the case. During his January 30, 2012 deposition, Mr. Salamat was asked whether he would agree that "the strategies that you lay out that you say ALPA had available to it are not persuasive arguments?" (p. 98). He responded: "I –wouldn't –I wouldn't characterize them as arguments, no." He was then asked: "And Sycara's work deals with persuasive arguments?" to which Mr. Salamat responded "Yes". Mr. Salamat's testimony confirms that he is fundamentally misapplying my theory, because (a) he

acknowledges that my theory is about persuasive argumentation, but (b) he admits that he does not consider the actions available to ALPA as persuasive arguments. As a result, any conclusions or estimates that Mr. Salamat draws from his misapplication of my theory are invalid.

Even if Mr. Salamat had not admitted that the strategies and actions he claims that ALPA had available to it are not persuasive arguments, a close examination of what my theory posits and how he attempts to use it in his report would confirm that he misapplied my theory. Below, I discuss seven additional methodological flaws in Mr. Salamat's use of my theory.

1. A key assumption underlying my model is that the negotiation at issue involves *multiple issues* and, as a result, that the use of persuasive arguments would enable each party to potentially change the beliefs and behavior of its counterparty in the negotiation. The existence of multiple issues permits each side in the negotiation to make useful tradeoffs among these issues to reach a mutually acceptable agreement.

However, Mr. Salamat has characterized the TWA MEC and APA negotiation as a negotiation over a single issue only, seniority (January 29, 2013 deposition, p. 198.).[1] My theory cannot be applied to a single issue negotiation, since the argumentation goals are to increase/decrease importance or perception of an issue relative to the other issues in the negotiation, or pursue goal abandonment. Thus, Mr. Salamat's attempt to apply my theory to the pilots' seniority integration negotiation fails on its own terms.

2. My model of argumentation is *qualitative*. In other words, it cannot be used to quantify the probability that a particular argument would change the importance of an issue to the persuadee. Although Mr. Salamat states that the probabilities he assigns are subjective, he uses these probabilities within the framework of my model, which is inconsistent with the design of my model.

Moreover, even if my model could have been used quantitatively, it would not be possible to reliably estimate the likelihood of changing perception, changing value, or bringing about goal abandonment without a detailed understanding of the APA's goals and belief structure, which Mr. Salamat did not attempt and about which he has no knowledge. In my persuasive argumentation theory, understanding the persuadee's goals and beliefs is crucial. The persuader considers the model of the persuadee in reasoning about which argumentation strategy to employ. In the TWA MEC/APA negotiations, from the TWA MEC's perspective—as Mr. Salamat construes it—the APA would be the persuadee. Mr. Salamat testified (in his January 29 deposition, p. 268) that he made no attempt to construct a model of the goals and beliefs of APA and their dependencies. He

[1] Contrary to his deposition testimony, even if Mr. Salamat were to claim that seniority integration involves multiple issues, nowhere in his report does he (a) identify the various issues that my argumentation theory would consider, (b) discuss the relative importance of each issue as well as possible tradeoffs between issues, or (c) create a belief structure that shows the dependence between the issues and beliefs of the persuadee. As discussed in the rest of my report, correct application of my argumentation theory requires considering each of these points.

states that his only sources of information for understanding the beliefs and goals of the APA were the APA correspondence referenced in his report and Mike Day's trial testimony. In responding to a question as to whether this was all he considered, he stated that "...all the experience I've had for the last dozen years was brought to bear on understanding the APA's position". He also admits, however, that he had never worked with the APA.

Having reviewed these sources, it is my opinion that they would not provide Mr. Salamat with a sufficient model of the APA's belief structure to apply my argumentation framework. My argumentation model requires a fine-grained understanding of the persuadee's goals and beliefs including the relative importance of different goals, the manner in which fulfillment of one goal contributes to achievement of other goals, and what utility fulfillment of a goal would bring to the persuadee. The above referenced sources do not provide information either as to these parameters (e.g. relative importance of one APA goal versus another) or the relationship between them. Knowledge of these parameters is a crucial part of my model since they form the basis for generating arguments. Additionally, since each airline merger is different in many ways to other mergers, a general experience, no matter how long, of working with pilots, especially since Mr. Salamat has not worked with APA, does not provide the fine-grained knowledge that is needed for correct application of my argumentation framework.

In multiple places in his deposition, Mr. Salamat says that had ALPA taken certain actions, the effects of the actions would have been to change the dynamics of negotiation or to make the negotiators negotiate more intensely (e.g. January 29 deposition, p. 239). He does not go into detail or explain exactly what it means to "negotiate intensely" or "how the dynamics of negotiation" would have been altered. Nor does he pose any criteria for how to measure the intensity of negotiation, to determine whether a negotiation has increased (or decreased) in intensity, or to predict the outcome of a more or less intense negotiation or of negotiations of the "same" intensity. Nor does he say how the beliefs and goals of the APA would relate to the altered dynamics of negotiation or the intensity of negotiation.

Because my model requires a representation of the structure of the persuadee's various beliefs, goals and their relationships, and because Mr. Salamat failed to undertake any rigorous analysis of the APA's beliefs, goals, and their relationships, Mr. Salamat has not properly applied my model.

3. Mr. Salamat fails to define what he means by goal abandonment in his report, and in particular Figure 3. For example on p. 129 of his deposition of January 30, 2012 he says that APA's goal was the staple size. But it is difficult to interpret what he means by abandonment of that goal. In a single issue negotiation, if one of the parties abandons the issue, there is no negotiation. Given that Mr. Salamat characterized the TWA/APA negotiation as a single issue negotiation over seniority, it would not have been possible for the APA to abandon its goals with respect to seniority. In addition, Mr. Salamat assigns a 2% probability of reaching an agreement for each of the actions that he classifies as promoting goal abandonment. Even if my model could be used to quantify

probabilities (a separate methodological problem discussed below), because Mr. Salamat misunderstands goal abandonment, this probability makes no sense.

4. Mr. Salamat appears confused about the notion of the persuadee changing his perception of an issue's value/utility as a result of an argument. He sometimes refers to ALPA's allegedly available actions as having the potential to change the persuadee's (APA's) perception of an issue's value. But at other times he refers to those actions as having the potential to change the persuadee's (APA's) perception of the other party (the TWA pilots), and in another part of his deposition (p. 80 of January 30, 2012 deposition) he suggests that those actions were about changing the TWA pilots' perception of the situation.

Further, on p. 197-198 of his January 29 deposition, Mr. Salamat says that in a single issue negotiation it is difficult to distinguish between changing the perception of an issue's value and changing the perception of the other party. In my theory, there is a distinction. An issue's value, as posited in my theory, is the utility that a particular proposal with regards to an issue would have for a party. For example an offer of a $50,000/year salary in a job negotiation may seem low to the job candidate. In other words, the job candidate perceives the offered salary as giving him low utility. On the other hand, perception of a party is more a matter of relative power between the parties. Mr. Salamat acknowledges this relation (p. 80 of January 30 deposition): "...the legal strategy [that Mr. Salamat alleges that ALPA had at its disposal] was to gain power in the negotiation, not to immediately force APA to do something. However, having gained more power, in the negotiation, it would have changed the perception of the TWA pilots and so, by extension, it would have changed the behavior of the APA."

5. Despite his testimony that the TWA MEC/APA seniority integration was a single issue negotiation, and his admission that changing the importance of an issue and changing perception of an issue's value are not distinguishable in a single issue seniority integration, Mr. Salamat nevertheless makes those two distinct columns in his Figure 3 (p. 10 of his report), and claims they would be individually influenced by actions that ALPA allegedly failed to pursue. He then adds the separate probabilities in the columns (discussed further below), which artificially increases the overall probability of a better hypothetical agreement for the TWA pilots if ALPA had undertaken the actions.

6. The overall goal of my argumentation model was to enable the generation of arguments, not to predict the arguments' quantitative effects on the probability of reaching a hypothetical agreement. Mr. Salamat did not use the model for generating arguments. Therefore, he misapplied my theory since my theory was not designed, and cannot be used, to estimate the probability of reaching an agreement.

Moreover, in order to generate effective arguments to bring about desirable tradeoffs in a multi-issue negotiation, the persuader considers the belief structure of the persuadee, and the argumentation goal the persuader wants to accomplish. Based on those, the persuader chooses an argumentation strategy, such as "indicat[ing] a change (increase or decrease) in the contribution of the present goal to a higher level goal of the persuadee," and

presents it to the persuadee. This is an iterative process. Since the persuader does not have perfect knowledge of the beliefs and goals of the persuadee, the persuader generates the argument, and depending on the persuadee's reaction—e.g. accepting or disagreeing with the argument or offering a counter-argument—updates its model of the persuadee's beliefs and generates another argument. Mr. Salamat did not consider, let alone take into account, the iterative process of argument exchange.

My theory posits *distinct* argumentation types that are effective for each of the three types of desired goal and belief changes: changing the importance of an issue, changing the perception of an issue's value, and pursuing goal abandonment. This means that the same argument cannot simultaneously change the importance of an issue and also lead to goal abandonment, or change the importance of an issue and also the perception of an issue's value.

Additionally, for certain types of arguments, such as threats (and promises) that aim to convince the persuadee to abandon one of his goals, my theory posits that the persuader must produce arguments that (a) would not backfire and (b) are credible. In order to produce effective threatening arguments, a persuader should consider whether his argument would backfire. To do so, the persuader must consider what strategies and actions are available to the persuadee that might produce undesirable results. Mr. Salamat states in his deposition that he did not consider actions and strategies at the APA's disposal. As it happens, the APA did have actions at its disposal such as insisting on its initial proposal or simply stapling all of the TWA pilots to the bottom of the integrated seniority list. A credible argument is one where the persuader has the means to bring about the threatened effect. In constructing a credible argument, therefore, the persuader must consider the persuader's ability to bring about or control events that would have deleterious effects for the persuadee. In his deposition Mr. Salamat took the position that ALPA had litigation and other actions at its disposal but did not take them. Moreover, Mr. Salamat concedes that ALPA, the persuader in this case, could not control the outcome of the various litigation actions, or of a request that the Department of Transportation make fair process a condition of the transaction. (January 30 deposition, p. 99-100.)

Moreover, Mr. Salamat states (p. 79 of his January 30 deposition) that he does not consider the actions that ALPA had at its disposal as threats or promises. Nevertheless, he treats litigations and other actions that ALPA did not pursue (e.g. Denied July 2001 Legal Strategy: Sue American and APA; denied October 2001 Legal Strategy: Case, APA injunction; the DOT request) effectively as threatening arguments and assigns probabilities to the Abandonment goal in his table in Figure 3. Mr. Salamat thus contradicts himself by admitting that the ALPA actions were not threatening arguments, but nonetheless treating them as such in his calculations. Moreover, he places the goal abandonment as a third column in his table of Figure 3, and assigns probabilities not only to the corresponding cells under goal abandonment but also the cells on Importance and Perception. Since my theory posits that argumentation strategies are distinct, in that they do not simultaneously affect importance, perception, and goal abandonment, Mr. Salamat clearly misapplies my theory.

7. On p. 9 of his report, Mr. Salamat says: "Using Sycara's methodology as a guide as to the relative importance of each type of influence, I developed a static table of probabilities that allow a methodical way to estimate the likelihood that the actions could have had in isolation. .....As shown in Figure 3, by assigning probabilities to each form of influence (ΔImportance was assigned at 3%, ΔPerception at 5% and Abandonment at 2%), a linear model… ". My argumentation model does not provide any guidance about the relative importance of changing an issue's perception versus importance or abandonment, and my model provides no basis for Mr. Salamat's assignment of probabilities to these forms of influence. Indeed, at his deposition Mr. Salamat admitted that his assignment of probabilities was subjective and essentially arbitrary.

VII. Mr. Salamat's Report Incorrectly Attempts to Estimate Probabilities

Even if Mr. Salamat's attempts to apply my model of persuasive argumentation to an analysis of damages in this case were not fundamentally flawed, for all of the reasons set forth above, his analysis would still be wrong because his estimate of the probability that a different seniority integration would be reached is both inconsistent with my theory and incorrect as a matter of mathematics.

To estimate the probability that an agreement more favorable to the TWA pilots (the Salamat agreement as he says in his deposition) would have been reached, Mr. Salamat assigns subjective, arbitrary probabilities to each cell in the table of Figure 3. He then adds all the probabilities in the rows and columns to get 73%, which he interprets as the probability of APA and the TWA pilots agreeing to the Salamat agreement.

The estimation model is simply wrong.

First, as discussed above, Mr. Salamat fails to meaningfully distinguish between the importance of an issue and the persuadee's perception of an issue's value. As a result, the three-column format he presents is incorrect.

Second, as Mr. Salamat acknowledged during his deposition (January 29, p. 206), he did not use any scientific methodology to determine the value of the probabilities that he assigned to the cells of the Table in Figure 3. Mr. Salamat also could not explain why he assigned the same numerical probability value to each column.

Third, adding the probabilities in each cell of the table is wrong as a matter of basic math. (Douglas C. Montgomery and George C. Runger, *Applied Statistics and Probability for Engineers*, Wiley 2010, Ch. 2, 3, and 5.) According to probability theory, probabilities can only be summed if the outcomes associated with an action are mutually exclusive. In other words, for Mr. Salamat's approach to be valid, an action that changes the Importance of an issue cannot change the Perception of an issue's value or lead to goal Abandonment.

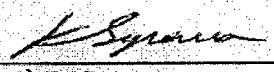
However, in Figure 3, ΔImportance, ΔPerception and Abandonment are not mutually exclusive, as Mr. Salamat states on p. 9 of his report: "For instance, ALPA providing

support to the TWA pilots (the last item in the list of actions), would have had the potential to effect some change in the importance the APA placed on one or more issues (such as fences, the value of TWA jobs, etc). This support, in isolation, may only have had a 3% chance of moving the APA toward an agreement. In combination with the potential to lead the APA to abandon goals (such as stapling), and change their perception of the TWA, support for the TWA pilots might only have had a 10% chance of obtaining an agreement". In other words, he considers that ΔImportance, ΔPerception and Abandonment can co-occur, i.e. they are not mutually exclusive.

A simple check of the validity of Mr. Salamat's method of combining probabilities shows that his method is wrong. The simple check is to slightly change the probabilities in the table and verify whether their sum is still less than or at most equal to 100% since the value of a probability cannot exceed 100%. As an example, consider increasing the probability in each cell of Figure 3 by 2%. A 2% increase in each cells results in 5% for ΔImportance, 7% for ΔPerception, and 4% for Abandonment. If one then adds the rows of the Table in Figure 3 with the new numbers and adds the column of the total of the rows, as Mr. Salamat did in Figure 3, the total is 113% which is wrong since the value of a probability cannot exceed 100%.

VIII. Conclusion

Based on my review of his work, Mr. Salamat has seriously misapplied my theory of persuasive argumentation. His report and deposition show multiple points of confusion in his understanding of the underlying concepts and assumptions of my theory. Mr. Salamat uses the wrong estimation framework; ignores fundamental assumptions about and preconditions for the applicability of my model; and attempts to use my model to generate probabilities in contravention of both my own theories and of basic math.



Katia P. Sycara
March 15, 2013

APPENDIX A – CURRICULUM VITAE

KATIA P. SYCARA

Personal Information

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Education

Ph.D.- 1987, Georgia Institute of Technology, Computer Science.
Thesis title - Resolving Adversarial Conflicts: an Approach Integrating Case-Based and Analytic Methods
Advisor - Prof. Janet Kolodner.

M.Sc.- December 1974, University of Wisconsin, Electrical Engineering and Computer Science.
Thesis title - Schedules as Models of Synchronous Parallel Computation.
Advisor - Prof. K. Vairavan.

M.Sc.- June 1971, University of Wisconsin, Mathematics.

B.Sc.- June 1969, Brown University, Applied Mathematics.
Thesis Title: Green's Theorem in Optimal control.
Advisor: Prof. J. P. LaSalle.

Research Interests

Artificial Intelligence and Robotics; Distributed Systems and Social Networks; Multi Agent/Robot Systems; Multi-Agent Planning; Multi-Agent Learning; Robot Human and Agent Teams; Intelligent Agents on the Web; Electronic Commerce; Argumentation, Negotiation, Auctions and Games; Semantic Web and Semantic Web Services; Case-Based Reasoning; Computer-supported Intelligent Enterprise Integration; Applications to Crisis Action Planning, Search and Rescue, Supply Chain Management, Command and Control.

Professional Experience

- Sixth Century Chair in Computing Science, University of Aberdeen, U.K. 2005.
- Research Professor, School of Computer Science, Robotics, CMU 1999-present
- Associate Research Professor, School of Computer Science, Robotics Institute, CMU 1994-1999
- Research Scientist, School of Computer Science, Robotics Institute, CMU, 1989-1994
- Research Associate, School of Computer Science, Robotics Institute, CMU, 1987-1989
- Research Assistant, School of CS, Georgia Institute of Technology, 1982-1987
- Senior Scientist and Head of Computing, Center for Planning and Economic Research, Athens, Greece, 1975-1982
- Planning Liaison to the European Economic Community, 1979-1980

Awards and Honors

- Selected as member of the National Academies Study "From Data to Decision: Integrating Humans, Machines and Networks" (2012-2014)
- Co-recipient (second time in a row) of the Semantic Web Scientific Association most influential 10-year paper award for the paper titled "Semantic Matching of Web Services Capabilities.". the award will get presented at the 11th International Semantic Web Conference (ISWC), Boston, USA, November 11-15, 2012.
- Co-recipient of the Semantic Web Scientific Association most influential 10-year paper award, for the paper titled "DAML-S: Semantic Markup for Web Services". The award got presented at the 10th International Semantic Web Conference (ISWC), Bonn, Germany, October 23-27, 2011.
- Fellow of the Association for the Advancement of Artificial Intelligence (AAAI), since 2002.
- Fellow of the Institute of Electrical and Electronic Engineers (IEEE), 2006.
- Recipient of the 2002 ACM/SIGART Award for Research Excellence in the field of Autonomous Agents and Multi-Agent Systems.
- Dr Sycara's robotic team placed third in the Worldwide Robocup Championship Competition in the Urban Search and Rescue Virtual robots League, Bejing, China 2008.

- Leader of a 25-member Delegation of AI and Robotics professionals from academia, industry and government to leading Research Institutions in China to assess the state of the art in AI and Robotics, October 2008.
- On the Scientific Advisory Board of the European Science Foundation Initiative on "Science and Technology of Agreement", 2008-present.
- World Champions (joint team STEEL with the University of Pittsburgh), International Robocup Search and Rescue Simulation League Competition, Atlanta, GA. May 2007.
- Honorary Doctorate, Department of Telecommunications and Information Technology, University of the Aegean, 2004.
- Recipient of the Outstanding Alumni Award, Computer Science Department, University of Wisconsin, 2005.
- First in Class Award for Autonomy, in Robocup Urban Search and Rescue, US Open, Atlanta, GA, 2005.
- First in Class Award for Mobility, in Robocup Urban Search and Rescue, US Open, Atlanta, GA, 2005.
- Member of the Scientific Advisory Board of the Institute of Informatics and Telecommunications of the Greek National Research Center Demokritos. 2004-present.
- Third in the International Robocup Urban Search and Rescue competition, US Open, New Orleans, May 2004.
- US Co-Chair of the US/Europe Initiative on Semantic Web Services, 2003-2007
- Member of the Scientific Advisory Board of France Telecom, 2003-2009.
- Founding Member and Member of the Board of the Semantic Web Science Association, 2002-2008
- Invited Expert for the Working Group of the World Wide Web Consortium (W3C) "Web Services Architecture", 2001-2003. The work of the Working Group resulted in a W3C Note, February 2003.
- Association for Computing Machinery (ACM) Recognition of Service Award (1998)
- Invited Speaker, National Conference on Artificial Intelligence (AAAI-97), 1997.
- Founding Member and Member of the Board of the International Foundation of Multi Agent Systems 1996-2010.
- Plenary Speaker, First International Conference on Multi Agent Systems, 1995.
- Fulbright Scholar, 1965-1969.
- Four Year Fellowship, Brown University, 1965-1969.

PUBLICATION LIST

Books and Book Chapters –Published

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Articles in Refereed Journals—submitted

Xu, Y., Scheller-Wolf, A., Sycara, K., Lewis M. "The Benefit of Introducing Variability in Quality Based Service Domains", submitted to *Operations Research.*

Zivan. R., Sycara, K., "Distributed constraint optimization for teams of mobile sensing agents", submitted to the *AI Journal.*

Lisy, V., Zivan, R., Sycara. K, "Minimizing the effect of deception in sensor networks using distributed constraint optimization techniques", submitted to *Computational Intelligence.*

Glinton R., Scerri, P., Sycara K., "Investigating the performance of scale invariant dynamics for information propagation in large teams", submitted to the *Journal of AI Research (JAIR)*

Articles in Refereed Journals—Accepted

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1. Burnett, C., Norman, T., Sycara, K. "Stereotypical Trust and Bias in Multi-Agent Systems", *ACM Transactions in Intelligent Systems and Technology,* vol 4, No. 2, 2013

2. Smart, P. and Sycara, K. "Collective Sensemaking and Military Coalitions", IEEE Intelligent Systems, January/February 2013.

3. Sensoy, M., Norman, T, Vasconcelos, W., Sycara, K. "OWL-POLAR: A Framework for Semantic Policy Representation and Reasoning, *Journal of Web Semantics*, Special Issue on Reasoning with Context in the Semantic Web, vol 12, 2012

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4. Sycara, K. Lu J. and Klusch M., "Interoperability Among Heterogeneous Software Agents on the Internet", Technical Report CMU-RI-TR-98-22.
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Other Publications

1. Sycara, K. "Multi Agent Interactions", In *Bots and Other Internet Beasties*, Williams, J. (Ed.), SamsNet Publishers, May, 1996.

Citation Index

--Katia Sycara currently ranks 517 in the Google Citeseer citation index out of 767,310 computer science authors

--Katia Sycara H-Index 42, G-Index 82, Experts H-index 53, G-Index 93

PROFESSIONAL ACTIVITIES

Journal Editorships

1. Founding Editor-in-Chief of the Journal *Autonomous Agents and Multi-Agent Systems*, Kluwer Academic Publishers. 1998-2007.
2. Associate Editor for the area of Semantic Web Services, International Journal of Service Oriented Computing and Applications, Springer, 2006-present.
3. Member of the Editorial Board of the International Journal on *Agent Oriented Software Engineering*, Interscience Publishers, 2004-present.
4. Member of the Editorial Board of the International Journal on *Web Intelligence and Agent Systems*, 2004-present.
5. Member of the Editorial Board of Journal of *Applied Intellignece*, 2004-present.
6. Member of the Editorial Board of *Fundamenta Informaticae* 2003-present
7. Member of the Editorial Board of the *International Journal for Infonomics*, 2003-present
8. Editor-in-Chief of the *Monograph Series on Agents*, Springer Academic Publishers. 1998-present.
9. Associate Editor of the Book Series *Multiagent Systems, Artificial Societies, and Simulated Organizations*, Kluwer Academic Publishers. 1998-present.
10. Associate Editor of the ETAI journal on the *Semantic Web*, 2000-2002.
11. Guest Editor, *AI Magazine, special issue on Intelligent Agents*, Summer 1998.
12. Area Editor for AI and Management Science of the Journal *Group Decision and Negotiation*, a Journal of The Institute of Operations Research and Management Science (INFORMS), Kluwer Academic Publishers. 1993-present.
13. Associate Editor of the Journal *Artificial Intelligence in Engineering*, Elsevier Science Publishers, LTD. 1994-1999.
14. Member of Editorial Board of the *International Journal of Concurrent Engineering: Research and Applications*, Academic Press, Ltd. 1994-present.
15. Member of Editorial Board of *IEEE Intelligent Systems and their Applications*, IEEE Computer Society. 1994-1999.
16. Guest Editor, *Group Decision and Negotiation, special issue on Distributed Artificial Intelligence*, Volume 2, No. 3, October 1993.
17. Guest Editor, *IEEE Transactions on Systems, Man and Cybernetics*, special issue on "Planning, Scheduling and Control: An AI Integrated Systems View", Volume 23, No. 6, November/December 1993.

Invited Keynote Talks

1. "Scalable Strategies of Human Control for Multi Robot Systems", The 16th World Scientific and Engineering Academy and Society on Computers, Kos, Greece, July 14-14, 2012.
2. "Network Dynamics of Information Propagation" 5th International Symposium on Intelligent Distributed Computing, Delft, the Netherlands, October 5-7, 2011.
3. "Propagation Dynamics of Beliefs in Large Heterogeneous Networks", 8th European Workshop on Multi-Agent Systems, Paris, France, December 16-17, 2010.
4. "Ontologies and Agents", NATO Advanced Study Institute on Software Agents, Tangiers, Morocco, September 17-23, 2010.

5. "Emergent Dynamics of Information Propagation in Large Networks", Seventh International Conference on Rough Sets and Current Trends in Computing, Warsaw, Poland, June 28, 2010.
6. "Modeling Human Traits in automated Negotiation", Conference on Human Factors and Models of Negotiation, Delft, The Netherlands, June 23, 2010.
7. "Agent Based Aiding in Human Teams", International Conference on Intelligent Agent Technology, Milan, Italy, September 18, 2009.
8. "Negotiation and Culture", Conference on Group Decision and Negotiation, Toronto, CA., June 15, 2009.
9. "Formal Computational Models of Negotiation", Symposium on Psychological and Computational Issues in Modeling Persuasion and Negotiation, Singapore, June 9, 2009.
10. "Agents and Semantic Services: A Critical Review", International Conference on Cooperative Information Systems, Prague, The Czeck Republic, September 10, 2008.
11. "Peer to Peer Computation in Large Scale, Open and Dynamic Environments", Workshop on Advanced Peer to Peer Computing, Estoril, Portugal, May 2008.
12. "Agents and Semantics In Open Distributed Environments", AAAI Fall Symposium on Regarding the Intelligence in Distributed Intelligent Systems Arlington, VA, November 9-11, 2007
13. "Coordination of Multiple Agents in Large Scale, Open and Dynamic Environments", IADIS Intelligent Systems and Agents, Lisbon, Portugal, July 2-5, 2007.
14. "Agents and Web Services for Autonomic Computing", IEEE/ACM/AAAI International Conference on Autonomic Computing (ICAC), Jacksonville, FLA, June 12-15, 2007
15. "Web Services and Agents: A Marriage that Transforms e-Business?" The Fifth IADIS WWW/Internet Conference, Murcia, Spain, October 5-8, 2006.
16. "New Directions in Automated Negotiation", International Conference on Group Decision and Negotiation, Karlsruhe, Germany, June 25-28, 2006.
17. "Web Services and Agents: A Marriage Made in Heaven?", Service Oriented Computing and Agent Based Engineering workshop, Hakodate, Japan, May 9, 2006.
18. "Geospatial Reasoning as a Context for High Level Information Fusion", International Symposium on Information Fusion and GIS, St. Petersburg, Russia, September 25-27, 2005.
19. "Semantic Web Services: A New Revolution for e-Commerce?", *IEEE International Conference on E-Technology, E-Commerce and E-Service*, Hong Kong, China, March 29-April 1, 2005.
20. "Agents Automating and Supporting Cooperative and Self Interested Interactions", *International Workshop on Intelligent Information Management Systems and Technology,* Shanghai, China, March 25-27, 2005
21. "Dynamic Discovery, Invocation and Composition of Semantic Web Services", *Fifth Conference of the Greek AI Society*, Samos, Greece, May 2004.
22. "Team Coordination of Cyber Agent Human and Robotic Teams: Urban Search and Rescue and UAV Control", *Monitoring, Search and Rescue in Agent Systems* (MSRAS), Plock, Poland, June 7, 2004.
23. "Software Agents: The Future of Web Services", *International Symposium on Multiagent Systems*, Crackow, Poland, June 10, 2004.

24. "From the Eyeball Web to the Transaction Web", 2nd International *Conference on Ontologies, Data Bases and Application of Semantics (ODBASE03),* Catania, Sicily, November 7, 2003.
25. "Software Agents: The Next Frontier of Web Services". *Web Technology Convergence Symposium*, MITRE McLean, VA., August 5, 2003, (other keynotes were Tim Berners Lee of W3C and MIT, and Bob Sutor VP of IBM)
26. "Agent Mediated Semantic Web Services: Challenges and Opportunities", *The Tenth International Conference on AI and Law*, Edinburgh, U.K. June 25, 2003.
27. "Autonomous Semantic Web Services", *The Fifteenth Conference on Advanced Information Technology Systems Engineering (CAiSE 03)*, Velden, Austria, June 19, 2003.
28. "Multiple Agent Supporting Humans and Organizations in Open, Dynamic Environments", *First International Conference on Autonomous Agents and Multiagent Systems,* Bologna, Italy, July 19, 2002.
29. "Infrastructure and Interoperability for Agent-Based Services" *International Symposium on Methodologies for Intelligent Systems*, June 29th, Lyons, France, 2002.
30. "The DAML-S language for Semantic Web Services", *OntoWeb Conference* 2002, Sardinia, Italy, June 14, 2002.
31. "Multi-Agent Infrastructure for Agent Interoperation in Open Computational Environments", *Second Asia-Pacific Conference on Intelligent Agent Technology (IAT'01),* Maebashi City, Japan, October 26, 2001.
32. "From Web Pages to Web Agents", *European Ontoweb Conference*, Crete, Greece, June 14, 2001.
33. "The Future of the Internet", *Software Technology Conference*, Salt Lake City, May 3, 2001.
34. "Environments for Agents and Agents for the Environment" *Input2001*, Tremiti, Italy, June 28, 2001
35. "Distributed Intelligent Agents on the Internet", Socionics Symposium, Closter Seon, Germany, June, 2000.
36. "Middle Agents for Open Information Systems", *Workshop on Agent Oriented Information Systems*, Seattle, WA., May 1, 1999.
37. "Distributed Intelligent Agents for Information Gathering and Decision Support", *International Computing Symposium*, Tainan, Taiwan, December 18, 1998.
38. "James Bond and Michael Ovitz: The Secret Life of Agents", invited talk at the *Fourteenth National Conference on Artificial Intelligence (AAAI-97)*, Providence, RI, July 27-31, 1997.
39. "Task-Based Coordination of Intelligent Agents", the *First Iberoamerican Workshop on Multi-Agent Systems*, Xalapa, Mexico, October 23-25, 1996.
40. "Agents in Financial Services", *Real-World Applications of Intelligent Agent Technology*, Heathrow, U.K., June 11-13, 1996.
41. "Intelligent Agents and the Information Revolution", *Intelligent Agents and their Business Applications*, London U.K., November 9, 1995.
42. "Coordination of Multiple Intelligent Agents in the Infosphere", *First International Conference on Multiagent Systems*, San Fransisco, CA. June 11-14, 1995.
43. "The Present and Future of Distributed AI", *Seventh Australian Joint Conference on AI*, Armidale, Australia, November 23-25, 1994.

44. "Information Integration in Concurrent Engineering", *International Conference on Concurrent Engineering Research and Applications*, Pittsburgh, PA., August 29-31, 1994.
45. "Evaluation of Case-Based Systems: A Study in Job Shop Scheduling", *AAAI-94 Workshop on Case Based Reasoning*, Seattle, WA., August 1-2, 1994.
46. "Issues and Directions in Distributed AI", *Fifth European Workshop on Modeling Autonomous Agents in a Multi-Agent World*, Neuchatel, Switzerland, August 25-27, 1993.
47. "The Theory and Praxis of Case-Based Reasoning", *The Tenth European Conference on Artificial Intelligence*, Vienna, Austria, August 3-7, 1992.
48. "Distributed Artificial Intelligence: Theory and Practice", *The IX Mexican Conference on Artificial Intelligence*, Veracruz, Mexico, July 27-31, 1992.
49. "Case-Based Design Synthesis", *DARPA Manufacturing Workshop*, Salt Lake City, Utah, January, 1992.
50. "Case-Based Learning in a Mixed Paradigm", *International Conference on Symbolic-Numeric Data Analysis and Learning*, Paris, France, September 1991.

Patents

"A Case-Based Scheduling Method for Creating a Schedule", USA Patent number 5574640, November 1996, (CMU Docket number 93-024).

Consulting

Katia Sycara has been engaged over the years in various consulting activities for a variety of technologies and companies.

Major Software Artifacts and Technology Transfer

Proactive Agent Assistance Technology was transferred to CERDEC, Aberdeen MD, 2012

Coordination technology for UAV and UGV Teams was transferred to CERDEC Ft. Monmouth, NJ, 2007, and 2008.

The RETSINA/Machinetta team coordination software was ported to UAVs at Eglin AFB and participated in a live test October 2005.

The OWL-S Integrated Development Environment. This is an Eclipse-based software environment for constructing Semantic Web Services based on the OWL-S language. Available at http://projects.semwebcentral.org/projects/owl-s-ide/ (2004-2005)

High Fidelity Robotic Simulator for Urban Search and Rescue. http://www.cs.cmu.edu/~softagents/usar_nsf_downloads/USARdownload.htm (2004-2005)

The OWL-S/UDDI Matchmaker http://www.daml.ri.cmu.edu/matchmaker/ (2003)

Semantic Web Service Tools http://www.daml.ri.cmu.edu/tools/ (2003)

Semantic Web Calendar Agent http://www.cs.cmu.edu/~softagents/cal/ (2002)

The RETSINA Multi Agent Infrastructure (a toolkit for constructing multi agent systems) available at www.cs.cmu.edu/~softagents. The toolkit has been downloaded by hundreds of users. (2001) and has been transitioned into different US Department of Defense Applications.

Involvement with Standards and Scientific Policy Activities

1. Member of review board Science and Technology panel for the Navy Capable Manpower set of programs, April 20, 2005.
2. Member of the Advisory Board of the international conference on Rough Sets and Knowledge Technology, 2005-present
3. Member of the Technical committee of the OASIS Standards body for UDDI (Universal Description, Discovery and Integration of Web Services), (2003-2006). The work of the Technical Committee resulted in the UDDI v.3.2 standard, announced Feb 1, 2005.
4. Member of the committee of the Robotics Institute at Carnegie Mellon that prepared the briefing materials and gave presentation during the Advisory Board Visit, Jan 18-19, 2005.
5. Member of the Council of the Robotics Institute at Carnegie Mellon (2003-present). The Council advises the Robotics Institute Director on strategic and operational matters.
6. Member of the W3C Technical Committee for the Web Services Architecture (2001-2003); this resulted in a W3C Note.
7. Founding member of the OWL-S Coalition, that designed the OWL-S language for Semantic Web Services. The work of the coalition resulted in a World Wide Web consortium (W3C) Note, November 2004.
8. Member of the Information Management Requirements Study, sponsored by DARPA, NASA and NSF 2001-2002. This study was influential in setting Information Technology scientific priorities and policy.
9. Member of the DARPA ISAT study on Robot-Agent-Person (RAP) Teams for Emerging Threats 2001.
10. Member of the Department of Defense Technology Area Review and Assessment (TARA) Review Panel for Information Technology, March 13-17, 2000, Rome Air Force Labs, Rome, NY. The panel reviews all scientific Information Technology investment for the DoD (namely all DARPA, AFOSR, ONR, ARI programs).
11. External reviewer of the Engineered Collectives Program of Sandia National Labs, September 8, 1999.
12. Reviewer for R&D technology of the Department of Strategy and Product Development, Siemens, Corporate Research, in the area of Intelligent Autonomous Agents, Munich, Germany, June 29 and 30, 1999.
13. Leader of a Scientific Delegation of Artificial Intelligence professionals to China, Peoples' Ambassador Program, June 6-20, 1998.

14. Member of the Steering Committee of the International Conference of Autonomous Agents, 1997-present.
15. Member of the DARPA ISAT Study on Intelligent Agents, 1996. *This study resulted in the multi-million DARPA Control of Agent Based Systems (CoABS) scientific program.*
16. Member of the Panel of the National Research Council "Every Citizen's Interface to the National Information Infrastructure", 1996.
17. Member of the committee that wrote the White Paper to the NSF, "The role of Artificial Intelligence in the National Information Infrastructure", 1995.
18. Founding member of the interest group on Group Decision and Negotiation of the Operations Research Society of America (ORSA) and The Institute of Management Science (TIMS), 1993.
19. Councilor, American Association of Artificial Intelligence, 1994-1997.
20. Chair, Scholarship Committee of the American Association of Artificial Intelligence 1994-1999.

Seminars and Colloquia at Universities

1. "Aiding of Human Teams via Agent Technology", Distinguished Lecture, University of North Carolina, Charlotte, February 26, 2010.
2. "The Many Faces of Automating and Supporting Multi-Agent Interactions", University Paris Descartes, Paris, France, October 16, 2007.
3. "Decentralized Multi-Attribute Negotiation", University of Karlsruhe, Germany, June 27, 2006.
4. "The Many Faces of Agents: Automating and Supporting Cooperative and Self Interested Interactions", University of Trento, Italy, June 6, 2005.
5. Sycara, K. "Autonomous Agents: The Next Generation of Web Services", University of Aberdeen, June 20, 2005.
6. "Semantic Web Services", Seminar Series of the Intitute for Software Engineering International, Carnegie Mellon University, January 13, 2005.
7. "Interactions of Multiple Heterogeneous Agents in Open Environments", Seminar Series, Department of Computer Science, University of Gdansk, Poland, June 14, 2004
8. "The Many Faces of Agents", Seminar Series, Department of Computer Science, University of Warsaw, Poland, June 16 2004
9. "Autonomous Semantic Web Services", School of Business, Universite Paris Dauphine, Paris, France, Dec. 5, 2002.
10. "Agent Technologies in Open Environments" Seminar Series, Department of Computer Science, University of Menendez Pelayo International University, Alicante, Spain, November 6, 2002.

11. "Multi Agent Support for Human Teams", Seminar Series, Department of Management of Information Systems, School of Business, University of Arizona, April 16, 2002.

12. "The Future of the Internet: From Documents to Agents", Seminar Series, Computer Science and Engineering, Iowa State University, November 16, 2000.

13. "Multi Agent Coordination and Learning", Department of Computer Science, Philadelphia, PA. September 20, 2000.

14. "Distributed Intelligent Agents", School of Business, Arizona, State University, June 25, 2000.

15. "The Future of Humans in Multi-Agent Systems", Seminar Series, Human Computer Interaction Institute, Carnegie Mellon University, April 28, 1999.

16. "RETSINA: A Distributed Multi-Agent Infrastructure for Information Gathering and Decision Support", Seminar Series, Robotics Institute, Carnegie Mellon University, April 2, 1999.

17. "Distributed Intelligent Agents in Open Environments", University of Maryland, College Park, April 3, 1998.

18. "Distributed Coordination of Intelligent Agents", Kyoto University, Kyoto, Japan, November 27, 1997.

19. "Intelligent Software Agents: The Next Generation", AI Seminar, Carnegie Mellon University, October 21, 1997.

20. "Distributed Information Agents", Computer Science Department, University of Toronto, September 28, 1995.

21. "Case-based Schedule Optimization", Computer Science Department, University of Toronto, October 19, 1994.

22. CABINS: A Framework for Knowledge Acquisition and Iterative Revision for Predictive Schedule Improvement and Reactive Repair", Robotics Seminar, Carnegie Mellon University, March 18, 1994.

23. "Case-Based Schedule Revision", AI Faculty lunch talk, Carnegie Mellon University, January 18, 1993.

24. "Conflict Resolution in Multi-Agent Planning", University of Southern California Information Sciences Institute, Los Angeles, CA., January, 1990.

25. "Non-Cooperative Multi-Agent Planning", University of Pennsylvania, Philadelphia, PA., November, 1989.

26. "Case-Based Reasoning in Conflict Resolution", Hubert Humphrey Center for Policy Studies, University of Minnesota, November, 1988.

27. "Modeling Negotiations: An Approach Integrating Case-Based and Analytic Methods", Colloquia Series in Decision Sciences, Carleton University, Ontario, Canada, October, 1988.

28. "Group Decision Support: A Computer Model", University of Ottawa Computer Science Colloquia Series, Ontario, Canada, October, 1988.

29. "The Role of AI in Manufacturing", Center of Planning and Economic Research, Athens, Greece, July, 1988.

30. "Resolving Adversarial Conflicts: An Approach Integrating Case-Based and Analytic Methods", Computer Science AI Seminar, Carnegie Mellon University, Pittsburgh, PA., January, 1988.

31. "Negotiation via Case-Based and Analytic Methods", School of Urban and Public Affairs, Carnegie Mellon University, Pittsburgh, PA., November, 1987.

32. "The Use of Experience in Multi-Agent Planning", Department of Computer Science, University of Southern California, Los Angeles, May, 1987.

33. "The Use of Experience in Multi-Agent Planning", Department of Computer Science, University of California, San Diego, April, 1987.

34. "Modeling Negotiations using AI Methods", Graduate School of Business, New York University, New York, April, 1987.

35. "The Role of Experience in Problem Solving", Department of Computer Science, University of Delaware, March, 1987.

Invited Talks to Industry and Government

36. "Modeling Synergies in Large Human Machine Networked Systems", AFOSR workshop on Software Engineering and Cognitive Modeling, Washington, DC, July 21-22, 2008.

37. "The Many Facets of Multi-Agent Systems", Navy Personnel Research Studies and Technology, Memphis, TN, NPRST, April 11, 2007.

38. "Intelligent Agents in Command and Control: Closing the Loop in Information Fusion", Advanced Robotics Workshop, Washington DC, (organized by MITRE), March 20-21, 2007.

39. "Large Scale Multi Agent Coordination in Adversarial Environments", LaASMA Workshop, Washington DC, (organized by the NSA), March 21, 2007.

40. "Agents: The future Evolution of Semantic Web Services", France Telecon Laboratories, Lannion, France, September 6, 2004.

41. "From Pages to Services and from Services to Agents", NIST, Gaithesburg, MD, April 1, 2002.

42. "Agents in Electronic Commerce", Electrotechnical Laboratoty, Tsukuba, Japan, Nov 18, 1997.

43. "Coordination of Intelligent Agents in Dynamic Environments", Sony Computer Science Laboratory, Tokyo, Japan, November 21, 1997.

44. "Distributed Intelligent Agents", Symposium on Mobile Agents, Technology and Research Institute, Ottawa, March 23, 1997.

45. "Distributed Manufacturing Scheduling", Daimler Benz Corporate Research Center, Berlin, Germany, November 13, 1995.

46. "Multi-Agent Scheduling", Australian Center for Artificial Intelligence, Melbourne, Australia, November 30, 1994.

47. "Research in Distributed Problem Solving", SONY Research Laboratories, Tokyo, Japan, November 14, 1991.

48. "Case-Based Reasoning and Applications", NEC Research Laboratories, Tokyo, Japan, November 13, 1991.

49. "Case-Based Reasoning in Manufacturing", ICOT, Tokyo, Japan, November 12, 1991.

50. "Knowledge-Based Scheduling", Mitsubishi Research Laboratories, Osaka, Japan, November 8, 1991.

51. "Distributed Scheduling", NTT Laboratories, Kyoto, Japan, November 6, 1991.

52. "Data Base Reasoning in Engineering Design" DARPA workshop on Intelligent Information Systems, Rome Laboratories, Rome Air Force Base, October 22-23, 1991.

53. "Integrating the Enterprise", Hewlett Packard Research Labs, Palo Alto CA., March 24, 1991.

54. "Intelligent Information Infrastructure for Enterprise Computing", Human Interface Technology Center, NCR Corporation, Atlanta, GA., October 18, 1990.

55. "Distributed Constraint-Directed Factory Scheduling", Carnegie Group Inc., Pittsburgh, PA., April 19, 1990.

56. "Planning and Scheduling in Complex Domains", First Phase Review of the Air Land Battle Management Program (ALBM), Key West, Fla. November 1988.

57. "Using Artificial Intelligence Methods in Negotiation", Fourth 1988 meeting of the Midwest Consortium for International Security Studies, a program managed by the American Academy of Arts and Sciences, Minneapolis, MN., November 1988.

58. "Case-Based Adversarial Planning", U.S. Army Ballistics Research Lab, Alexandria, Va., September, 1988.

59. "The Use of Previous Cases in Planning", INTEL Corp., San Jose, CA., May, 1987.

60. "Case-Based Adversarial Planning", Honeywell Research Labs, Min., MN, May, 1987.

61. "Resolving Goal Conflicts: A Computer Model", BBN, Cambridge, Mass., April, 1987.

62. "The Role of Experience in Problem Solving", Bell Labs, New Jersey, March 1987.

63. "Modeling Negotiations using AI Methods", IBM Watson Labs, Yorktown Heights, February, 1987.

Tutorial Presentations

1. Sycara, K. and Yu B. "Distributed Robotic Sensor Systems", Tenth International Conference on Information Fusion, Quebec City, CA, July 9-12, 2007.

2. Sycara, K. and Martin, D, "Tools and Technologies for Semantic Web Services: An OWL-S Perspective", Fifth International Semantic Web Conference, Athens, GA. Nov 6, 2006.

3. "Agents in the Real World", tutorial presentation in the Americas Multi Agents School, Pittsburgh, PA., July 7, 2005.

4. Sycara K., "Tools and Technologies for Agent Mediated Semantic Web Services", Fourth International Joint conference on Autonomous Agents and Multi Agent Systems, Utrecht, The Netherlands, July 25, 2005.

5. Sycara K., "Semantic Web Services", Second European Semantic Web Conference, Heraklion, Greece, May 29, 2005.

6. Sycara, K., "Tools and Technologies for Semantic Web Services", Third International Semantic Web Conference, Hiroshima, Japan, November 7, 2004.

7. Sycara K., "Software Architectures for Multi agent Systems", tutorial given in the India Multi-Agents School, Hyderabad, India, August 12-17, 2004.

8. Sycara K., "Agent-Based Semantic Web Services", Third International Joint Conference on Autonomous Agents and Multi-agent Systems, New York, NY, July 20, 2004

9. Sycara K., "OWL-S and Semantic Web Services", International Conference on Web Services, San Diego, California, July 6 2004

10. Sycara K., "Agent-Based Web Services and Grid Services", Second International conference on the Semantic Web, Sanibel Island, Fla., October 2003.

11. Sycara K., "Agent-Mediated Web Services", the Fifth International Conference on Electronic Commerce, Pittsburgh, PA., September 2003.

12. Sycara K., "Semantic Web Services", NET.Obhject Days Industry Conference, Erfurt, Germany, September, 2003.

13. Sycara K., "Agent-Mediated Web Services", First International Conference on Autonomous Agents and Multi-agent Systems, Bologna, Italy, July 16, 2002.

14. Sycara K., "Semantic Web Services", First International Semantic Web Conference, Sardinia, Italy, June 9, 2002.

15. Sycara K., "Multiagent Infrastructure and Semantic Interoperability", 2nd European Summer School, Prague, Check Republic, July 9, 2001.

16. Sycara K., "Distributed Coordinating Intelligent Agents". Tutorial Presentation, The First International Conference on Autonomous Agents, Marina del Ray, February 5-8, 1997, (120 participants).

17. Sycara K., "Case-Based Reasoning: Theory and Practice", Tutorial Presentation, IJCAI-93, Chambery, France, August, 1993, (60 participants).

18. Sycara K., "Distributed Artificial Intelligence Tools", Tutorial Presentation, AAAI-93, Washington, DC, July 1993, (45 participants).

19. Sycara K., "Case-Based Reasoning", Tutorial Presentation, Tenth European Conference on Artificial Intelligence, Vienna, Austria, August, 1992. (30 participants).

20. Sycara K., "Distributed Artificial Intelligence Tools", Tutorial Presentation, AAAI-92, San Jose, CA., July 1992, (69 participants).

21. Sycara K., "Case-Based Reasoning", Tutorial Presentation, IJCAI-91, Sydney, Australia, August 24, 1991, (35 participants).

22. Sycara K., "Case-Based Reasoning", Tutorial Presentation, AAAI-91, Anaheim, CA., July 15, 1991, (125 participants).

Presentations in conferences that do not publish proceedings

1. "An Integrated Approach to Production Planning and Control", ORSA/TIMS Joint National Meeting, Nashville, Tennessee, May, 1991.

2. "Integrating Artificial Intelligence and Operations Research Techniques in Modeling Negotiations", 12th Triennial Conference on Operations Research, Athens, Greece, June 27, 1990.

3. "Ancient Wisdom and Operations Research Methodology of Today: Objective and Subjective Reality", 12th Triennial Conference on Operations Research, Athens, Greece, June 28, 1990.

4. "Design by Teams of Experts", CORS/SCRO National Conference, Ottawa, Canada, May, 1990.

5. "Dealing with Unusual Situations in Negotiation", TIMS/ORSA Joint National Meeting, Las Vegas, Nevada, May, 1990.

6. "Coordination of Manufacturing Activities", ORSA/TIMS Joint National Meeting, New York, October 1989.

7. "Problem Reformulation During Negotiations", ORSA/TIMS Joint National Meeting, New York, October 1989.

8. "Negotiation as a Metaphor for Group Decision Support", Tenth European Conference on Operational Research, Beograd, Yugoslavia, June 1989.

9. "Integration of Multiple Representations in Negotiation Support", CORS/TIMS/ORSA Joint National Meeting, Vancouver, Canada, May 1989.

10. "Organization of a Case Memory for Negotiation Support", CORS/TIMS/ORSA Joint National Meeting, Vancouver, Canada, May 1989.

11. "Negotiation Support: An AI Approach", EUROTIMS International Conference, Paris, France, July 1988.

12. "Mediation in Distributed Decision Support". TIMS/ORSA Joint National Meeting, Washington, DC., April 1988.

13. "Case-Based Reasoning for Decision Support", ORSA/TIMS Joint National Meeting, St. Louis, MIS., October, 1987.

Panel Presentations

1. "The Network is Up: Who Cares?", the first International Conference on the Information Technology Alliance, Washington DC., September 25-27, 2007.

2. "Distributed Agent Based Information Fusion", the Ninth International Conference on Information Fusion, Quebec City, CA, July 9-13, 2007.

3. "Semantic Web Service" (panel chair). Scientific Symposium, France Telecom, Paris, January 11, 2006.

4. "Semantic Web "Semantic Web and Web Services: A marriage Made in Heaven?", (panel chair) The 13th International World Wide Web Conference, New York, N.Y., May 17-22, 2004.

5. "Challenges of the Semantic Web", panel presentation, The 2002 OntoWeb conference, Sardinia, Italy, June 13, 2002.

6. "Case-Based Reasoning in Manufacturing", panel presentation, World Congress of Expert Systems, Orlando, Fla., December 15-17, 1991.

7. "Evolving Approaches to Group Decision and Negotiation", panel presentation, TIMS/ORSA National Meeting, Orlando, Fla., April 27, 1992.

8. "Case-Based Reasoning: Concepts and Applications", panel presentation, The World Congress on Expert Systems, Orlando, Fla. December 17, 1991.

9. "The Role of Shared Models in Belief Formation", panel presentation, AAAI Stanford Spring Symposium, Palo, Alto CA., March 26 1991.

10. "Concurrent Multi-Agent Planning, Scheduling and Control", panel presentation, DARPA workshop on Innovative Approaches to Planning, scheduling and Control, San Diego, CA, November 6, 1990.

11. "Group Decision and Negotiation in Operations Management", Panel Presentation, ORSA/TIMS National Meeting, Philadelphia, PA., October 30, 1990.

Involvement in Conference Organization

General Chair or Program Chair

1. Conference co-Chair, IEEE Intelligence and Security Informatics (ISI), Bejing, China, July 2011.
2. Program Co-Chair of the IJCAI workshop on "Negotiation and Culture" , Pasadena, CA. July 13, 2009.
3. Program Co-Chair of the Agents for Autonomic Computing, ICAC, Barcelona, June 15-19, 2009.

4. Program Co-Chair of the IEEE International Conference on Service Oriented Computing and Applications (SOCA 07), Newport Beach, CA, June 19-20, 2007.
5. Co-organizer of the European Semantic Web Conference Workshop on OWL-S: Experiences and Future Developments, Innsbruck, Austria, June 7 2007
6. Program Co-chair of the AAMAS workshop on Service Oriented Computing: Agents, Semantics and Engineering (SOCASE), Honolulu, Hawaii, May 14, 2007.
7. Program co-chair of the Sixth IEEE/ACM International Conference on Intelligent Agent Technology, Hong Kong, December 18-22, 2006.
8. Program Co-chair of the Semantic Web and Web Services workshop (collocated with the OTM conference), Montpellier, France, October 29-November 3, 2006.
9. Program Co-Chair for the Intelligent Agents Track in the 2005 IEEE/WIC/ACM International Conference on Intelligent Agent Technology, Campiegne, France, September 19-22, 2005
10. Program Chair, 3rd International Conference on Ontologies, Data Bases and Application of Semantics, Agia Napa, Cyprus, October 26-29, 2004.
11. Program Chair, Second International Semantic Web Conference, Sanibel Island, Florida, USA, October 2003.
12. General Chair, Second International Conference on Autonomous Agents (Agents 98), Minneapolis, MN. May 1998
13. General Chair, Twelfth International Workshop on Distributed Artificial Intelligence, Hidden Valley Resort, PA., May, 1993.
14. General Chair, DARPA Planning Workshop on Innovative Approaches to Planning, Scheduling and Control, San Diego, CA., November, 1990.
15. Program Chair, Workshop on Integrated Architectures for Manufacturing, Eleventh International Joint Conference on AI, Detroit, Mich., August 1989.

Panel Chair

16. Panel Chair for the WWW04 panel on Web Semantics and Web Services, May 2004.
17. Panel Chair, "Numeric-Symbolic Induction", International Conference on Symbolic-Numeric Data Analysis and Learning, Paris, France, September, 1991.
18. Panel Chair, "Case-Based Reasoning Meets the Real World", Case-Based Reasoning Workshop, Washington, DC., May, 1991.
19. Panel Chair, "Case-Based Reasoning and Design", The Fifth IEEE Conference on AI Applications, Miami, Fla., March 1989.

Program Committee Member

20. PC Member of IEEE Conference on Security Informatics, Washington DC, June 12-14, 2012
21. SPC member AAMAS 2012, Valencia, Spain, June 4-8, 2012
22. PC Member, Conference on Group Decision and Negotiation, Recife, Brazil, May 20-24, 2012.
23. PC Member on Agents and Data Mining Interaction (ADMI) Workshop, Valencia, Spain, June 4-5, 2012.
24. PC Member of the Models of Sequential Decision Making (MSDM) Workshop, Valencia , Spain June 4, 2012.
25. PC member of ICRA 2012.
26. PC Member of SocialCom 2012
27. PC Member of IROS 2012

28. PC Member of International Conference on Computational Models of Argument (COMMA 2012), Vienna, Austria, September 10-12, 2012
29. SPC member of AAMAS 2011, Taipei, Taiwan, May 2011
30. PC member of ICRA 2011, Shanghai, China, May 2011
31. PC member of AAMAS 2010, Toronto, CA, May 2010
32. Area Chair of the AAMAS-2009, Budapest, Hungary, May 10-15, 2009
33. PC Member for the IEEE conference on Intelligence and Security Informatics, 2009.
34. PC member of ArgMAS, AAMAS workshop
35. PC member of AAMAS workshop on Agents for Games and Simulations, AAMAS May 11-12, Budapest, Hungary, 2009.
36. Senior Program Committee Member of the 3rd Asian Semantic Web Conference, Thailand, December 8-11, 2008
37. Senior Program Committee Member, AAMAS-2008.
38. PC member for AAAI-2008 (Nectar Track)
39. PC for Information Technology Alliance Conference, 2008
40. PC for Conference on Cooperative Information Agents, 2008
41. PC Member Service Oriented Computing Workshop, AAMAS-07, Honolulu, Hawaii, 2007.
42. PC Member for Cooperative Information Agents, Delft, the Netherlands, September 2007.
43. PC member for the International Workshop of Autonomous Intelligent Systems: Agents and Data Mining, St Petersburg, Russia. June 3-5, 2007.
44. PC Member for the International Conference on Web Services (ICWS-07), July 9-13, Salt Lake City, Utah, 2007.
45. PC Member of AAAI, 2007, Vancouver, CA. July 22-26, 2007.
46. PC Member of the International Conference on Autonomous Agents and Multi Agent Systems, Honolulu, Hawaii, May 13-19, 2007.
47. PC member of the 9th International Conference on Electronic Commerce, Minneapolis, MN. August 20-22, 2007.
48. PC member of the 1st International Workshop on Agent Technology for Sensor Networks (ATSN-07), Honolulu, Hawaii, May 14-15, 2007.
49. PC Member of the International Conference on Web Services, September 18-22, Chicago, USA, 2006.
50. PC Member of the International Conference on Cooperative Information Agents (CIA-06), Edinburgh, UK, September 11-13, 2006.
51. PC member of the 4rht International conference on Service Oriented Computing (ICSOC'06) , Chicago, USA, December 3-7, 2006.
52. PC Member of the International Conference on Knowledge Science, Engineering and Management, Guilin, China, August 5-8, 2006.
53. Senior PC Member of the International Semantic Web Conference (ISWC), Athens, GA. USA, November 5-9, 2006.
54. PC member of the Rough Sets and Knowledge Technology, Chongqing, July 24-26, 2006.
55. PC of the IEEE Workshop on Dependability in Large Scale-Service oriented Systems, April 20-22, Vienna, Austria, 2006.
56. PC Member of the Semantic Web Track, AAAI-06, July 16-20, Boston, MA. 2006.

57. PC Member of the European Semantic Web Conference, Budva, Montenegro, June 11-14, 2006.
58. PC member of the IEEE International Conference on Intelligence and Security Informatics (ISI-06), San Diego, CA. May 22-24, 2006.
59. PC member of the World Wide Web Conference, Semantic Web Technologies Track, Edinburgh, UK., May 23-26, 2006.
60. PC member of the Workshop of Very Large Data Bases Conference on Technologies for E-Services, Trondheim, Norway, September 2-3, 2005.
61. PC member of the Symposium for Multi Agent Systems for Security and Survivability, 2004; 2005.
62. PC Member of the IJCAI 2005 Workshop on Multi Agent Information Retrieval and Recommender Systems, Edinburgh, Scotland, July 30-31, 2005.
63. PC Member, 4rth International conference on Ontologies, Data Bases and Application Semantics, Agia Napa, Cyprus, Nov 1-3, 2005.
64. Program committee member of: IEEE International Conference on Service Computing, 2004, 2005
65. Reviewer, AAAI-05
66. PC member AAMAS 2005, 2006, 2007..
67. PC member of the European Semantic Web Conference (ESWC), 2004, 2005, 2006.
68. PC member, Policy Management for the Web, WWW04 Workshop, Japan, May 10, 2005.
69. Reviewer, IJCAI 2003, 2004, 2005.
70. Senior Program committee member for the Third International conference on Autonomous Agents and Multi-agent Systems, New York, NY, July 2004
71. Senior Program Committee Member of the Third International Semantic Web Conference (ISWC 04), Hiroshima, Japan, Nov 2004.
72. PC Member of the ISWC04 Workshop on Trust, Security and Reputation on the Semantic Web, Hiroshima, Japan Nov 7, 2004.
73. Member of the Steering Committee of the ISWC 04 Workshop on Semantic Web Services, Hiroshima, Japan, July 8, 2004.
74. Program Committee Member of the First International Conference on Autonomic Computing, May 2004.
75. Program Committee Member, "International Conference on Autonomous Agents and Multiagent Systems, 2002, 2003.
76. Program Committee Member: International conference on Case Based Reasoning, 2002, 2003
77. Program Committee Member: Software Engineering for Multiagent Systems, 2002, 2003
78. Program Committee Member: Agent Mediated Electronic Commerce Worskhop, 2001, 2002, 2003
79. Program Committee Member: Peer to Peer Computing Workshop: 2002, 2003
80. Program Committee Member, Workshop on Ontologies in Multiagent Systems, 2003, 2004.
81. Program Committee Member, International Conference on Autonomous Agents 2001
82. Senior Program Committee Member, International Conference on Autonomous Agents 1999, 2000.

83. Program Committee Member, Agent Theories Languages and Methodologies Workshop, 1997, 1998, 1999, 2000, 2001, 2002.
84. Program Committee member, Cooperative Information Agents Workshops, 1999, 2000, 2001, 2002.
85. PC Member for the Coordination Conference 2000, 2002
86. Program Committee Member, AAAI99, AAAI2000
87. Program Committee member, IJCAI99, IJCAI2003
88. Senior Program Committee Member, Genetic and Evolutionary Computation Conference, 1999, 2000.
89. Program Committee Member, Cooperative Information Systems Workshop, 1999.
90. Program Committee member, Agents in Cyberspace, AAAI Spring Symposium, 1999.
91. Program Committee member, Robocup Workshop, 1998, 2000, 2001, 2002, 2003. 2004, 2005.
92. Program committee member, Electronic Commerce, Workshop, Agents World, July 1998.
93. Program committee member, AI and Link Analysis, AAAI Fall Symposium, 1998.
94. Program Committee Member, the Fourth International Workshop on "Agent Theories, Architectures and Languages, AAAI-97, Providence, RI., July 24-26, 1997.
95. Program Committee Member The Fourteenth National Conference on Artificial Intelligence, (AAAI-97), Providence, RI., July 27-31, 1997.
96. Program Committee Member, the Second International Conference on Case-Based Reasoning, Providence, RI. July 23-25, 1997.
97. Program Committee Member, International Conference on Practical Applications of Intelligent Agents and Multi-Agent Technology (PAAM97), London, UK, April 21-25, 1997.
98. Program Committee Member and Member of the Advisory Board, The Second International Conference on Multi-Agent Systems, Kyoto, Japan, December 1996.
99. Program Committee Member, the Eighteenth Annual Conference of the Cognitive Science Society, San Diego, CA. July 12-15, 1996.
100. Program Committee Member The Thirteenth National Conference on Artificial Intelligence, (AAAI-96), Portland, Oregon., August 4-8, 1996.
101. Program Committee Member, International Conference on Case Based Reasoning, Sesimbra, Portugal, October 23-26, 1995.
102. Program Committee Member, the Fourteenth International Joint Conference on Artificial Intelligence (IJCAI-95), Montreal, CA. August 1995.
103. Program Committee Member, Plan Recognition Workshop, IJCAI-95, August 20, 1995.
104. Program Committee Member, The 2nd International Conference on Concurrent Engineering Research and Applications, Washington, DC, August 23-25, 1995.
105. Program Committee Member, The Seventeenth Annual Conference of the Cognitive Science Society, Pittsburgh, PA., August, 1995.
106. Program Committee Member, the Eleventh IEEE Conference on AI Applications (CAIA-95), Los Angeles, CA., February 19-22, 1995.

107. Program Committee Member and Member of the Advisory Committee for the First International Conference on Multi Agent Systems, San Francisco, CA June 10-14, 1995
108. Program Committee Member, the Third International Conference on Information and Knowledge Management, National Institute of Standards and Technology, Gaithersburg, MD., Dec, 1994.
109. Program Committee Member, the Sixteenth Annual Conference of the Cognitive Science Society, Atlanta, GA. August 13-16, 1994.
110. Program Committee Member The Twelfth National Conference on Artificial Intelligence, (AAAI-94), Seattle, WA., July 30-August 4, 1994.
111. Program Committee Member, Workshop on Computational Dialectics, AAAI-94, Seattle, WA., July 30, 1994.
112. Program Committee Member, the Thirteenth International Workshop on Distributed Artificial Intelligence, Seattle, WA., July 28-30, 1994.
113. Program Committee Member Conference on Cooperating Knowledge Based Systems, Keele, England, June 15-17, 1994.
114. Program Committee Member, the Thirteenth International Joint Conference on Artificial Intelligence (IJCAI-93), Chambery, France, August 1993.
115. International Advisory Board Member, AI in Design Conference Series (1991-1994).
116. Program Committee Member, The Tenth National Conference on Artificial Intelligence (AAAI-92), San Jose, CA. July, 1992.
117. Program Committee Member, First International Conference on AI Planning Systems, College Park, Maryland, June 1992.
118. Program Committee Member, the Eleventh International Workshop on Distributed Artificial Intelligence, Glenn Arbor Michigan, February, 1992.
119. Program Committee Member, International Conference on Symbolic-Numeric Data Analysis and Learning, Paris, France, September, 1991.
120. Program Committee Member, the Eleventh International Joint Conference on Artificial Intelligence (IJCAI-91), Sydney, Australia, August, 1991.
121. Program Committee Member, Workshop on Reasoning in Adversarial Domains, IJCAI-91, Sydney, Australia, August 1991.
122. Program Committee Member, Defense Advanced Research Projects Agency (DARPA), Case Based Reasoning Workshop, Washington, DC., May, 1991.
123. Program Committee Member, Workshop on Reasoning in Adversarial Domains, AAAI-90, Boston, Mass., July 29-August 3, 1990.
124. Program Committee Member, Workshop on Concurrent Engineering Design, AAAI-90, Boston, Mass., July 29-August 3, 1990.
125. Program Committee Member, The Sixth IEEE Conference on AI Applications, Santa Barbara, CA., March, 1990.
126. Local Arrangements Chair for the First workshop on Theoretical Issues in Conceptual Information Processing (TICIP), Atlanta, Ga. April, 1984.

Reviewing

Journals: The AI Journal, Applied AI, Artificial Intelligence in Engineering, Autonomous Agents and Multiagent Systems, Computational Intelligence,

Communications of the ACM, Group Decision and Negotiation, IEEE Intelligent Systems and their Applications, IEEE Transactions on SMC, IEEE Transactions on Robotics and Automation.

Funding Agencies: US. National Science Foundation, The Canadian Science Foundation, The Israeli Science Foundation, The Ireland Science Foundation, The European Commission Esprit Programme.

Professional Societies

American Association of Artificial Intelligence (Fellow),
Institute for Electronic and Electrical Engineers (Fellow)
Institute for Operations Research and Management Science (INFORMS)
Association for Computing Machinery (ACM),
Cognitive Science Society,

University Service

Member of the University Level Committee for un-tenured faculty (2011 to present)

CONTRACT AND GRANT SUPPORT

In all contracts, I am the PI

May 14 2011-May 13 2013 ARL, "Distributed Logical and Probabilistic Reasoning over Dynamic Coalition Networks", $420,000

July 1, 2009- May 31, 2013, ONR Science of Autonomy, "Cognitively Compliant Command for Multirobot Teams", $ 2,124, 012

July 15 2008-July 14 2013, ARO MURI, "Modeling Cultural Factors in Collaboration and Negotiation", $3,750,000.

July 1 2008-November 30 2013, AFOSR MURI, "Modeling Synergies in Large Human-Machine Networked Systems", $4,500,000.

September 17, 2008-September 30 2012, ONR MURI, "A Structural Approach to the Incorporation of Cultural knowledge in Adaptive Adversary Models", $ 4,500,000 (co-PI)

Dec 2007- November 2010, Darpa, Landroids, "Reconfigurable LANdroid Agent Control Software (ReLACS)", subcontract to L3-Communications, CMU budget $1,505,209.

March 2007-December 2007, L3-Communications, "Distributed Intelligent Agents", $500K

December 2006-November 2009, AFOSR, "Large Scale Distributed Computation for Human Agent Team Coordination" (with Michael Lewis, U. of Pittsburgh), $1,158,749

May 2006-April 2010 Darpa, "POIROT: Plan Order Induction from Reasoning from One Trial", $ 1,898,000

May 2006-April 2011, US Army Research Laboratory, "Wireless Networking and System Security in Coalition Settings", $860,000

Dec 2005-December 2006, L3-Communications, "Cognitive Sensor Study", $500,000.

Dec 2005-Dec 2006, Lockheed Martin, "P2P Distributed Discovery of Semantic Web Services" $100,000

May 16-Dec 9, 2005, L3-Communication Integrated Systems, "Cognitive Sensor Study", $170,000.

February 1, 2005-January 31 2009 Darpa, "Plan Decomposition and Organizational Design for Semi-Automated Coordination", $2,298,980

May 05- October 2005, Navy Personnel Office, "Decision Support Systems for Multi-Attribute Negotiation", $270,000.

Dec 2004-Dec 2005, Lockheed Martin, "Distributed Discovery of Semantic Web Services Infrastructure for Survivability and Robustness" $100,000

Dec 2003-Dec 2004, Lockheed Martin, "Peer to Peer Semantic Web Services", $100,000

July 2004 January 2005 Navy Personnel Office "Distributed Negotiation with Outside Options" $170,000

December 2004 –December 2006 Darpa, "Effective Platform Modeling for Seamless and Dynamic Integration of Heterogeneous RSTA Assets for HURT" $1,500,000

2003-2004, ARDA program on Insider Threats, "Self Describing and Self Protecting Documents through Agent Mediation". $244,788

January 2004 – July 2004 Navy Personnel Office "Agent-Based Negotiation Models for Sailor Career Management" $170,000

2003-2005 AFRL/MN (with Mike Lewis of the U. of Pittsburgh) "Agent Technology and Human Factors for Cooperative Attack Munitions Real-Time Assessment (CAMRA)", $980,000

2002-2005 ONR "Agent Based Composition of Behavioral Models" $625,000

2002-2005 ONR, (with Dan Siewiorek) "Interoperability of Future Information Systems" $900,000

2002-2005 DARPA, "Agent-Assisted, Context-Based Collaboration Across Information Spaces" AXIS-GENOA II. $750,000

2002-2006, NSF ITR (with Mike Lewis and Illah Nourbakhsh), "Coordination of Heterogeneous Teams (Humans, Agents, Robots) for Emergency Response. $1,400,000

2001-2006, AFOSR (with Mike Lewis) "Effective Information Fusion: From Data to Actionable Knowledge and Decision" $2,250,000

2001 – 2004, NASA, (with Bonnie John) "Effective Team Support: From Task and Cognitive Modeling to Software Agents" . $1,164,000

1999 – 2005, DARPA, "Specification of Agent Services for DAML". $1,600,000

1999 - 2000: SANDIA National Labs, "Agent-Based Mediation and Cooperative Information Systems". $250,000

1998 - 2002: DARPA, "Effective Coordination of Multiple Intelligent Agents for Command and Control". $1,800,000

1997 - 2000: National Science Foundation, "Using Option Pricing to Value Commitment Flexibility in Multi Agent Systems". $254,100

1996 - 1999: National Science Foundation, "Learning in Negotiation: A Sequential Decision Making Model and Applications". $339,307

1996 - 2001: Office of Naval Research (MURI), "Integrating Intelligent Assistants into Human Teams" (with Michael Lewis, U. of Pittsburgh). $5,041,723

1995 - 1998: Office of Naval Research, "Situation-Aware Coordination of Intelligent Agents". $563,650

1995-2000: Office of Naval Research, "Integrated Vision and Sensing Systems for Human Sensory Augmentation".$293,140

1995 - 1998: DARPA, "Manufacturing Planning: Scale Up and Optimization" (with D. Navin-Chandra). $1,020,750

1995 - 1996: NSF, "Task-Based Information Agents". $50,000

1995 - 1997: Dept. of Defense TRP, "NII Health Information Network". $670,000

1993 - 1997: DARPA, "Intelligent Integration of Information through Learning and Negotiation" (with Tom Mitchell). $2,356,150

1994 - 1997: Office of Naval Research, "Towards a Designer's Brainstorming Assistant" (renewal) (with D. Navin-Chandra). $500,000

1993 - 1996: Office of Naval Research, "AASERT grant Case-based Reasoning Vision System for ATR " (with K. Ikeuchi). $130,000

1992 - 1994: Office of Naval Research, "Towards a Designer's Brainstorming Assistant" (with D. Navin-Chandra). $350,000

1991 - 1994: DARPA, "CORTES constraint-directed scheduling and planning" (with M. Fox,
S. Roth and N. Sadeh). $2,008,100

1991 - 1993: DEC, "Enterprise Integration". $150,000

1990 - 1993: DARPA, "Flexible Coordination in Military Transportation Scheduling" (with S. Smith). $1,610,000

1989 - 1993: AFOSR, "Case-Based Engineering Design" (with D. Navin-Chandra). $550,000

THESIS ADVISOR

PhD Students

1. Ronghuo Zhang Year of Studies: Third Department: Opcrations Management, Tepper School of Business

2. Ying Xu Year of Studies: Fourth Department: Operations Management, Tepper School of Business

3. Lingzhi Luo Year of Studies: Fifth Department: Robotics

4. Tinglong Dai Year of Studies: Sixth Department: Operations Management, Tepper School of Business

5. Prasana Velagapudi Department: Robotics Thesis Title: Distributed Planning Under Uncertainty for Large Teams, **PhD granted. August 2012**. Current position: Postdoctoral Fellow, robotics Institute, CMU.

6. Steven Okamoto Department: Computer Science Thesis Title: Allocating Virtual and Physical Flows for Multiagent Teams in Mutable, Networked Environments, **PhD granted August 2012.** Current position. Postdoctoral Fellow, University of the Negev, Israel.

7. Guoming Lai Department: Operations Management, Tepper School of Business Thesis Title: Essays in Operations Management with Strategic Consumer Behavior Earnings Management, and Capital Financing **Ph D Granted: May 2008**. Position: Assistant Professor, School of Business, University of Texas, Austin

8. Gita Sukthankar Department: Robotics Thesis Title: Activity Recognition for Physically-Embodied Agent Teams **PhD Granted: August 2007**. Current position: Assistant Professor, University of Central Florida

9. Mary Berna Department: Robotics Thesis Title: Interleaving Planning and Execution in Multi- Robot Coordination: A Constraint Based Approach: On leave of absence: working for robotic startup company in Pittsburgh.

10. Anupriya Ankolekar Department: Human Computer Interaction Institute Thesis Title: Towards the Semantic Web as a Collaboration Platform for the Open Source Software Community **PhD granted: September 2005** Current position: Research Scientist, HP Labs

11. Yuriy Nevmyvaka Department: Robotics Thesis Title: Automated Market Makin **PhD granted: August 2005**

12. Cuihong Jennifer Li Department: Tepper School of Business Thesis Titlle: Combinatorial Coalitions and Outsourcing in Supply Chains **PhD granted: May**

2005. Current position: Associate Professor, School of Business, University of Connecticut

13. Wei Yang Department: Tepper School of Business Thesis Title Three Essays on Operations Management **PhD granted: December 2004**. Current position: Associate Professor, Business School, Long Island University

14. James Thomas Department: Computer Science Thesis Title: Bringing News into Trading Rules **PhD granted: May 2003**. Current position: hedge fund analyst, Philadelphia.

15. Huang Pu Department: GSIA (currently Tepper School of Business) Thesis title: Economics-based Techniques for Multiagent System **PhD granted May 2003**. Current position: Department of Mathematical Sciences, IBM T.J. Watson Laboratory

16. Mo ZhengChun Department: Architecture Thesis Title: An Agent-Based Simulation-assisted Approach for Bilateral Building Systems Control **PhD granted: May 2003**

17. Matthew Glickman Department: Computer Science Thesis Title: Evolving the Variation Process and Scaling Up Evolutionary Search **PhD granted: August 2001** Current position: Research Scientist, Sandia National Laboratory.

18. Dajun Zeng Department: GSIA (currently Tepper School of Business) Thesis Title: Multi-Issue Decision Making in Supply Chain Management and Electronic Commerce **PhD granted: May 1999**. Current position: Professor, Eller School of Business , University of Arizona

19. Terani Madhusudan (co-advisor D. Navinchandra) Department: GSIA (currently Tepper School of Business) Thesis Title: On Synthesis of Electromechanical Assemblies - Automated Generation and Evaluation of Design Alternatives **PhD granted: May 1998**

20. JyiShane Liu Department: Robotics Thesis Title: Coordination of Reactive Agents in Distributed Manufacturing Scheduling **PhD granted: May, 1996**. Current position: Professor, Department of Computer Science, National Chen Chi University, Taipei, Taiwan

21. S. Narasimhan (co-advisor D. Navinchandra) Department: Civil Engineering Thesis Title: A Case-Based Model for Schematic Design Synthesis **PhD granted: May, 1996**. Current position: Researcher, Lockheed-Martin Research Lab, Palo Alto, CA.

MS Students

22. Sasanka Nagavalli, Department of Robotics, "Neglect Benevolence for Robotic Swarms"

23. Andrew Lybarger, Department Robotics, Thesis research "Next Best View in Challenging Environments"

24. Anika Gupta Department of Language Technologies, Thesis research "Extracting Social Networks form Twitter Data for Different Cultures"

25. Shuo, Han Year of Studies Second Department Robotics Thesis: "Activity Recognition for Robotic Assistance", **MS granted: December 2012.**

26. Nathan Brooks Department: Robotics Thesis: "Scalable Target Detection for Large Robot Teams" **MS granted: August 2011.**

27. Sriddharth Mehrotra Department: Robotics Thesis: "effects of Robot Self-Reflection on Operator Control of Robot Teams" **MS Granted: May 2010**

28. Bruno Hexsel Department: Robotics Thesis: "Coverage Control for Mobile Anisotropic Sensor Networks" **MS granted: December 2010**

29. Breelyn Kane Department: Robotics Thesis Title: "The Operator: A Valuable Resource: Asking for Help through Adaptable Autonomy" **MS Granted: January 2010**

30. Kevin Lee (MS) Department: International Networking Institute (INI) Thesis: Multi-threaded Mobile Processes **MS granted: May 2004**

31. Austin Fath (MS) Department: INI Thesis: Interoperability for Future Information Systems **MS granted: May 2004**.

32. Rahul Singh (MS) Department: Robotics Research Area: Multiagent Systems **MS granted December 2003.**

33. Bryan Kuntz (MS) Department: INI Thesis Title: Socket Migration **MS granted: May 2002**

34. Karthik Rajan (MS) Department: INI Thesis Title: Socket Migration and Process Migration for Mobile Agents **MS granted: May 2002**

35. Jian-jung Ying (MS) Department: INI Thesis Title: Buyers' Coalitions in Electronic Markets **MS granted: December 2000**

36. Yi-An Chen (MS) Department: INI Thesis Title: Coalition Formation on the Internet **MS granted: December 2000**

37. Mohammed Nuri (MS) Department: INI Thesis Title: SCRIPTOR: Programming by Demonstration **MS granted: May 2000**

38. Jiang Bin Li (MS) Department Language Technology Institute **MS granted: May 1999**

39. Naomi Capertillo (MS) Department: INI Thesis Title: Byer Groups for Volumen Discounts **MS granted: December 1998**

40. Leo Boon Quiat (MS) Department: INI Thesis Title: Byer Coalition in Retail Markets **MS granted: December 1998.**

41. Ravi Guttal, (M.S.) (co-advisor D. Navinchandra) Department: Civil Engineering Thesis Title: Case Retrieval as a subgraph isomorphism problem for integrated qualitative and case-based reasoning systems **MS granted: August 1991**.

Students outside CMU

42. Alice Toniolo Department of Computer Science University of Aberdeen, UK. **PhD expected: October 2012**

43. Daniele Masato Department of Computer Science University of Aberdeen, THESIS TITLE UK. **PhD granted 2012**

44. Dingeman Verwaart "Agent-based Modeling of Culture's Consequences for Trade, Technical University, Delft, the Netherlands, **PhD granted June 2011**

45. Chris Burnett Department of Computer Science University of Aberdeen Thesis Title PhD granted: 2010

46. Yang Xu Department of Information Sciences University of Pittsburgh Thesis: Token-Based Approach for Scalable Team Coordination **PhD: April 2008**

47. Jumpol Polvichai Department of Information Sciences University of Pittsburgh Title: Modeling Team Performance for Coordination Configuration of Large Multi-Agent Teams **PhD: April 2008**

48. Jijun Wang Department of Information Sciences University of Pittsburg Title: Human control of Cooperating Robots **PhD: April 2008**

49. Georgios Chalkiadakis Computer Science Department University of Toronto Thesis: A Bayesian Approach to Multiagent Reinforcement Learning and Coalition Formation under Uncertainty PhD granted, **December 2007.**

50. Lalana Kagal Computer Science Department University of Maryland, Baltimore County Thesis: A Policy-Based Approach to Governing Autonomous Behavior in Open Distributed Environments **PhD granted: December 2004** Current position: Research Fellow at the World Wide Web Consortium, MIT

51. Leonardo Garrido Computer Science Dept. ITESM Monterrey, Mexico. Thesis Title: An Empirical Investigation on Quantifying the Competitive Advantages of an Agent Learning Models of other Agents in a Multiagent Competitive Environment **PhD granted: December 2001.** Current Position: Assistant Professor, Computer Science Department, ITESM, Monterrey, Mexico

52. Terri Lenox Department of Information Science University of Pittsburgh Thesis Title: Supporting Teamwork Using Software Agents in Human-Agent Teams **PhD granted: June 2000** Current position: Assistant Professor, computer Science Department, Westminster College, Pennsylvania.

53. Claudia Goldman Department of Computer Science The Hebrew University of Jerusalem Thesis Title: Multiagent Learning Systems **PhD granted: August 2000.** Current position: Senior Post Doctoral Researcher, Dept of Computer Science, University of Massachusetts, at Amherst

54. Igor Jurisica Department of Computer Science University of Toronto Thesis Title: Representation and Management for Case-Based Reasoning Systems **PhD granted: June 1997.**

55. Alexandros Moukas Media Lab MIT Thesis Title: Amalthea: An Evolving Multi-Agent Information Filtering and Discovery System for the WWW **MS granted: June 1997**

56. Feniosky Pena-Mora Department of Civil Engineering MIT Thesis Title: Negotiation in Concurrent Engineering **PhD granted: June 1994.**

57. Herald Kjellin Department of Computer Science Stockholm University Thesis Title: A Method for Acquiring and Refining Knowledge in Weak Theory Domains **PhD granted: June 1994.**

APPENDIX B - DOCUMENTS CONSIDERED

Academic Articles/Texts

Cecilia Albin, "The Role of Fairness in Negotiation", *Negotiation Journal*, Vol. 9, Issue 3, pp. 223-244, July 1993.

David A. Lax and James K. Sebenius, "The Power of Alternatives or the Limits to Negotiation", *Negotiation Journal*, Vol. 1, Issue 2, pp. 163-179, April 1985.

George Lowenstein, Samuel Issacharoff, Colin Camerer, and Linda Babcock, "Self-Serving Assessments of Fairness and Pretrial Bargaining", *Journal of Legal Studies*, Vol. 22, No. 1, pp. 135-159, Jan. 1993.

Douglas C. Montgomery and George C. Runger, *Applied Statistics and Probability for Engineers*, Wiley 2010.

Roger B. Myerson, "Nash Equilibrium and the History of Economic Theory", *Journal of Economic Literature*, Vol. 37, Issue 3, pp. 1067-1082, Sept. 1999.

Jeffrey Z. Rubin and I. William Zartman, "Asymmetrical Negotiations: Some Survey Results That May Surprise", *Negotiation Journal*, Vol. 11, Issue 4, pp. 349-364, October 1995.

James K. Sebenius, "Negotiating Analysis: From Games to Inferences to Decisions to Deals", *Negotiation Journal*, Vol. 25, Issue 4, pp. 449-465, Oct. 2009.

Katia P. Sycara, "Persuasive Argument in Negotiation", *Theory and Decision*, Vol. 28, No. 3, pp. 203-242, May 1990.

Katia P. Sycara, "Resolving Adversarial Conflicts: An Approach Integrating Case-Based and Analytic Methods", Ph.D. Thesis, Georgia Institute of Technology, 1987.

Leigh Thompson and George Lowenstein, "Egocentric Interpretation of Fairness and Interpersonal Conflict", *Organizational Behavior and Human Decision Processes*, Vol. 51, Issue 2, pp. 176-197, March 1992.

Lane Tracy and Richard B. Peterson, "A Behavioral Theory of Labor Negotiations—How Well Has It Aged?", *Negotiation Journal*, Vol. 2, Issue 1, pp. 93-108, Jan. 1996.

Richard E. Walton and Robert B. McKersie, *A Behavioral Theory of Labor Negotiations*, McGraw-Hill 1965.

Michael Watkins, "Building Momentum in Negotiations: Time-Related Costs and Action-Forcing Events", *Negotiation Journal*, Vol. 14, Issue 3, pp. 241-256, July 1998.

Court Documents

Brady v. *Air Line Pilots Association, International* trial transcript

Depositions

Deposition of Jeffrey Brundage, October 23, 2012
Deposition of Donald Carty, October 15, 2012
Deposition of John Darrah, November 29, 2012
Deposition of Rikk Salamat, January 29-31, 2013
Deposition of Edwin White, Jr., October 12, 2012

Documents in Record

AA 0247-48, AA 0269-72

ALPA 001808-27, ALPA 005326, ALPA 008899-901, ALPA 008905, ALPA 009504, ALPA 009518-19, ALPA 021021-22, ALPA 029680-84, ALPA 030234-43

J-168, J-283, J-284, J-285, J-289, J-295, J-310, J-317, J-327, J-329, J-352

P-343, P-344, P-345, P-351

Plaintiffs' Expert Reports

Expert Report of Rikk Salamat, October 12, 2012